EMDF Comments Primarily Related to the Clean Water Act, Mercury, and PCBs
Due DOE June 7, 2022

Submitted to: OakRidgeEM@orem.doe.gov
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Subject: Comments primarily related to the Water Quality Protection of Bear Creek fact sheet, page 4 concerning mercury discharge limits, PCBs, and antidegradation and the TSCA ARAR exemption or waiver in the Site Groundwater Characterization fact sheet.

On November 4, 2021, several former TDEC employees sent a letter concerning the Environmental Management Disposal Facility (EMDF) to EPA Administrator Michael S. Regan. The December 29, 2021, response from Acting Assistant Administrator Barry N. Breen stated the EPA, DOE, and TDEC will solicit and consider public comments on new information before EPA and DOE finalize the ROD. This response letter encouraged us to review new information added to the Administrative Record file as well as provided to the public on a dedicated website. The website includes the following new information:

EMDF Site Groundwater Characterization fact sheet

EMDF Waste Acceptance Criteria fact sheet

EMDF Water Quality Protection for Bear Creek fact sheet

Draft Record of Decision – July 2021

Draft ROD Responsiveness Summary

Technical Memo #1: Phase 1 Field Sampling Results (July 2, 2018)

Technical Memo #2: Phase 1 Monitoring (May 23, 2019)

Development of Fish Tissue and Surface Water Preliminary Remediation Goals (April 28, 2022)

Performance Assessment for the Environmental Management Disposal Facility at the Y-12 National Security Complex, Oak Ridge, Tennessee (April 23, 2020)

Composite Analysis for the Environmental Management Waste Management Facility and the Environmental Management Disposal Facility, Oak Ridge, Tennessee (April 16, 2022)

Link to the Oak Ridge Environmental Information System (OREIS)

The Water Quality Protection for Bear Creek fact sheet discusses setting protective limits for Bear Creek and on page 4 discusses mercury discharge limits and specifies the State's antidegration rule applies to methylmercury and PCBs. The following comments focus on mercury and PCBs and Water Quality Protection for Bear Creek and downstream.

1) If Clean Water Act pollutants in addition to mercury and PCBs are present in the EMDF discharge, CERCLA requires that applicable CWA requirements apply to those pollutants.
2) The *Focused Feasibility Study for Water Management for the Disposal of CERCLA Waste on the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE/OR/01-2664&D2) was in formal dispute

during the previous EMDF Proposed Plan public comment period and was not available for public comment. This focus feasibility study was supposed to determine discharge levels for the existing Environmental Management Waste Management Facility (EMWMF) and the proposed Environmental Management Disposal Facility (EMDF), which is the subject of this public comment period. The dispute resolution to this formal dispute is relevant to discharge of CWA pollutants including mercury and PCBs and even though the resolution was after the previous comment period that information is not included as new information on the dedicated website. An additional version of the focused feasibility study was submitted after the Proposed Plan comment period that was not approved by EPA and TDEC. Seeking public comment on the Water Quality Protection for Bear Creek fact sheet prior to resolution of said Focus Feasibility Study for Water Management puts the cart before the horse.

3) The *Strategic Plan for Mercury Remediation at the Y-12 National Security Complex Oak Ridge Tennessee* (DOE/OR/01-2605&D2/R1) states that mercury contamination at the Y-12 National Security Complex (Y-12) was identified as the greatest environmental risk on the Oak Ridge Reservation (ORR) and Table 1 shows 2 million pounds of mercury, much of which was apparently lost to the environment or in building structures, was unaccounted for. The Focus Feasibility for Water Management includes an analysis that shows disposing Y-12 waste in EMDF may cause significant mercury concentrations in EMDF landfill wastewater[i]. **It does not make sense for the federal government to spend hundreds of millions of dollars on a mercury treatment plant to reduce mercury releases to East Fork Poplar Creek during decommissioning, demolition, and remediation of Y-12 and then to move waste containing mercury to the proposed EMDF, not correctly apply the State's antidegradation rules, and release the mercury into the same watershed via Bear Creek.**
4) **The current Environmental Management Waste Management Facility (EMWMF) is authorized to accept TSCA PCB waste yet controlling release of Clean Water Act (CWA) pollutant PCBs to surface water has not been a priority.** The Focus Feasibility Study for Water Management[ii] was supposed to determine discharge criteria for a future EMDF and the existing EMWMF. This Focus Feasibility Study screened out PCBs from being a contaminant of concern due to the number of non-detected values for PCBs in EMWMF landfill wastewater discharge even though PCB detection limits and reporting limits of said discharge samples were generally 100 to 1000 times greater than promulgated recreational use water quality criteria. Bear Creek is designated for recreational use and promulgated water quality criteria for total PCBs in surface water designated for recreational use is 0.00064 ug/L. EMWMF discharges to Bear Creek surface water during February 2003 utilized a detection limit for PCB-1260 of about 2 times the water quality criteria at 0.00125 ug/L. Oak Ridge Environmental Information System (OREIS) data shows that since March 2003 detection limits for PCB-1260 in EMWMF landfill wastewater discharges ranged from 0.0311 to 0.532 ug/L with reporting limits ranging from 0.0317 to 0.61ug/L. Wastes containing PCBs such as Disposal Area Remedial Action (DARA) soil and debris were disposed in EMWMF and wastewater discharge sampling has been insufficient to monitor PCBs at recreational use water quality criteria in wastewater discharged to Bear Creek. PCB-1260 is found in fish in Bear Creek and there are higher concentrations in fish upstream near EMWMF than downstream.
5) **The proposed landfill discharge as presented in the Water Quality Protection for Bear Creek fact sheet is impermissible because it violates the Antidegradation Statement (Rule 0400-40-03-.06) of Tennessee's water quality standards and thus also violates the Water Quality Control Act.**
Tennessee's water quality standards are found in regulation and are composed of three parts: stream-use classifications, general water quality criteria, and the Antidegradation Statement. The

latter regulates when and if degradation, the movement of water quality from better to worse quality, can be authorized. Tennessee's water quality standards have been approved by EPA, apply for any action subject to the Clean Water Act (CWA) in Tennessee, and unless officially waived are applicable requirements for CWA pollutants under CERCLA at the Oak Ridge Reservation (ORR).

DOE's Water Quality Protection for Bear Creek fact sheet addresses antidegradation and correctly states that it applies, particularly in regard to bioaccumulative substances like PCBs and mercury. But it then vaguely states that the requirements of this rule will be addressed by later water quality improvements, such as studying the processes in which methylation occurs.

That is simply not how antidegradation in TDEC rules works.

According to this rule, if a stream has unavailable parameters for a substance proposed as a new or increased discharge, that additional substance loading can only be allowed if it has been shown to be neither measurable nor bioaccumulative. Clearly, Bear Creek and downstream East Fork Poplar Creek are impacted for PCBs and mercury and are unavailable for new loadings of those substances.

Thus, any new or increased discharge of mercury and/or PCBs into Bear Creek is impermissible. An increased discharge refers to increased loading or adding additional parameters at an existing discharge irrespective of whether there is an increase or decrease in discharge volume.

The way we understand the new EMDF, it proposes a new or increased discharge of bioaccumulative unavailable parameters and approval of the discharge violates the antidegradation rule.

To make sure the antidegradation rule concerning unavailable parameters mercury and PCBs is clear, it states at TDEC Rule 0400-40-03-.06(2)(a) the following:

> In waters with unavailable parameters, new or increased discharges that would cause measurable degradation of the parameter that is unavailable shall not be authorized. Nor will discharges be authorized in such waters if they cause additional loadings of unavailable parameters that are bioaccumulative or that have criteria below current method detection levels.

Note that the rule also includes the requirement that discharges are impermissible if unavailable parameters in the discharge cannot be measured to the water quality criteria or there is increased loading of an unavailable bioaccumulative pollutant. Therefore, discharges of PCBs and mercury to Bear Creek at a future EMDF are also impermissible due to current detection and reporting limits DOE uses at the existing CERCLA landfill (i.e., EMWMF) for those parameters.

The fact sheet also suggests that since fish in Bear Creek are small and current recreational use is limited, the concern about bioaccumulative substances is mitigated. This is an improper suggestion. While the size of existing fish and public recreational access might be factors in whether the State issues a fish consumption advisory, it is not a factor in whether or not recreational criteria or the antidegradation rule apply. Bear Creek is classified for this use and the criteria and antidegradation rule properly apply at full strength.

6) **The Site Groundwater Characterization fact sheet references a request to waive a TSCA requirement at 40 CFR 761.75(b)(3), that *"There shall be no hydraulic connection between the site and standing or flowing surface water"*. This is not protective of human health and should not be granted.** The existing EMWMF is authorized to accept TSCA PCB waste and as stated in another comment, control of discharge of PCBs to surface water has not been a priority for almost 20 years. Recall that the Focus Feasibility for Water Management screened PCBs out from being a contaminant of concern for the proposed EMDF based on the number of detections of PCBs when detection and reporting limits were 100 to 1000 times higher than promulgated recreational use water quality criteria. Isolation of the EMDF site from surface water is needed during landfill operations, closure, and post closure to protect human health and the environment from PCB pollution.
7) **Waste containing PCBs should not be disposed in a future EMDF. EMDF should not be approved for disposal of TSCA waste, the TSCA waiver requested in the Site Groundwater Characterization fact sheet should not be granted, and TSCA waste containing PCBs should be shipped offsite to a permitted facility.** CERCLA at 42 U.S. Code § 9621(d)(1) requires that "Remedial actions selected under this section or otherwise required or agreed to by the President under this chapter shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." (Emphasis added). With an existing 10^{-4} excess lifetime cancer risk (ELCR) from PCBs[iii] in fish in Bear creek, moving waste containing PCBs from elsewhere on the Oak Ridge Reservation (ORR) to EMDF and releasing additional PCBs to Bear Creek surface water is inconsistent with said control of further release required by CERCLA.
8) Consistent with the Water Quality Protection of Bear Creek fact sheet, DOE stated at the May 17th public meeting that the discharge criteria for mercury into Bear Creek is 51 parts per trillion (ppt). The fact sheet also states that antidegradation applies to methylmercury instead of mercury. Setting discharge criteria at 51 ppt mercury with antidegradation based on methylmercury instead of mercury violate applicable requirements. To be consistent with applicable requirements, mercury discharge limits would be based on:
   a) **EPA Comment 104 on the EMDF D1 Record of Decision (ROD) states *"In order to meet the CWA requirements and be consistent with the NCP, the discharge must meet the most stringent of either the [Technology Based Effluent Limits (TBEL)] (which has yet to be determined), a [Water Quality Based Effluent Limit (WQBEL)], or an antidegradation-based limit."***
   b) Bear Creek is listed on the 303(d) list of impaired and threated waters for mercury, not methylmercury. Antidegradation applies to mercury.
   c) 51 ppt is the promulgated water criteria that, when combined with maximum flow rate, can be used to develop the water quality-based effluent limit for mercury.
   d) Water Quality Protection for Bear Creek fact sheet specifies treatment will include, at a minimum, chemical flocculation/precipitation, and sediment removal. This is likely not an appropriate methodology to establish the TBEL for mercury. To be consistent with applicable CWA requirements, a TBEL for mercury must be established.
   e) Antidegradation-based limits for mercury based on applicable requirement TDEC Rule 0400-40-03-.06(2)[iv] should also incorporate:
      i) New or increased discharges of unavailable parameters, such as mercury, shall not be authorized if the discharge would cause measurable degradation of surface water for the unavailable parameter. Bear Creek is included on the 303(d) list for mercury and a 95% UCL mercury concentration of 5.17 ng/L (ppt) with a median of 3.3 ng/L (ppt) can be

calculated in Bear Creek surface water near the proposed EMDF.[v] Authorizing discharges of mercury that would increase mercury in-stream concentrations violates antidegradation based limits. And

ii) Discharges of bioaccumulative parameters, such as mercury, will not be authorized if they cause additional loading of the unavailable parameter (e.g., mercury). Neither the Focus Feasibility for Water Management[vi] nor the EMDF D1 ROD include competent loading analysis that verifies proposed discharge criteria do not increase mercury loading to Bear Creek. Without that analysis, antidegradation based discharge criteria are not determined and any approval of discharge limits is inconsistent with the Clean Water Act (CWA) applicable requirement and the NCP. A competent baseline mercury loading analysis for EMWMF is needed to determine anti-degradation-based limits for a future EMDF.

f) To help understand the impact of using concentration based limits verses mass based limits, consider the following example. These increases of mercury in Bear Creek would all be allowable if the discharge standard is based solely on 51 ppt without consideration of mass limitations and antidegradation.

i) Discharges at 51 ppt (ng/L) at 1 gallon per minute would release a mass of about 193 nanograms (ng) of mercury per minute to surface water. A 193 ng/minute discharge mixed in 335 L/min results in an increase of in-stream mercury of about 0.57 ppt.

ii) Discharges at 51 ppt at 30 gallons per minute would release a mass of about 5,792 ng of mercury per minute to surface water. A 5,792 ng/minute discharge mixed in 436 L/min results in an increase of in-stream mercury of about 13.3 ppt.

iii) Discharges at 51 ppt at 172 gpm would release a mass of about 33,205 ng of mercury per minute to surface water. A 33,205 ng/minute discharge mixed in 986 L/min results in an increase of in-stream mercury of about 33.7 ppt.

The 95% UCL for flow from EMWMF for the period of calendar year (CY) 2016 through CY 2020 was about 172 gpm. The 30-day 5-year recurrent flow in Bear Creek near the proposed EMDF is estimated at about 335[vii] liters per minute (L/min). For each example, instream water volume to calculate the in-stream concentration increase was the sum of 335 L/min and the discharge flow rate.

9) **The 51 ppt concentration-based discharge limit for mercury proposed by DOE in the Water Quality Protection of Bear Creek fact sheet violates applicable TDEC rule 0400-40-10-.03(3)(f) requiring mass limitations**.

10) **Setting discharge limits for protection of water quality in Bear Creek is good. However, irrespective of the limits, if monitoring of discharges are not consistent with applicable monitoring requirements for NPDES discharges, Water Quality Protection for Bear Creek and downstream is not ensured.** Developing discharge standards that are protective of human health and the environment and that meet applicable or relevant and appropriate requirements (ARARs) are required by CERCLA and the NCP. However, if monitoring is not improved compared to current activities at EMWMF, even with discharge standards, the impact on human health and environment is uncertain. For example, for calendar year (CY) 2020, 2 samples of landfill wastewater effluent discharged from EMWMF to surface water were analyzed for mercury. Similarly, for CY 2021, 2 samples of landfill wastewater effluent discharged from EMWMF to surface water were analyzed for mercury. Laboratory methods, method detection limits, and reporting limits for these samples were insufficient to quantify mercury released. Methods such as EPA method 1631 or 1631E are available with lower detection limits than those used. Analyzing only 2 samples per year of landfill wastewater discharge for mercury with detection limits higher than levels of mercury released leaves a lot of room for mercury pollution

in discharges to be missed. Further, at EMWMF, contact water is accumulated in contact water tanks and ponds and the contact water is batch released to the sedimentation basin. Landfill wastewater flows from the sedimentation basin to surface water. Releases from contact water tanks and ponds to the sedimentation basin are not documented in OREIS and it is unknown whether the 2 samples analyzed per year were collected before, during, after, or between releases from contact water ponds and tanks to the sedimentation basin.

11) The focus in the Water Quality Protection for Bear Creek fact sheet is on Recreational use and protecting humans using surface water is important. However, both CERCLA and Tennessee ARARs require protecting the environment (e.g., fish and aquatic life). **The Record of Decision should also include effluent toxicity testing, biological integrity monitoring, and other measures to ensure protection of the environment.**

12) **Several TDEC rules applicable to release of mercury, and PCBs, referenced on page 4 of the Water Quality Protection for Bear Creek fact sheet include:**

a) **TDEC Rule 0400-40-05-.08(1) EFFLUENT LIMITATIONS AND STANDARDS**

(g) All pollutants shall receive treatment or corrective action … to insure compliance with any approved water quality standard, …

(k) All permit effluent limitations, standards, and prohibitions shall be established for each outfall or discharge point of the permitted facility, except as otherwise provided for BMPs where limitations on effluent or internal waste streams are infeasible.

(m) For continuous discharges, all permit effluent limitations, standards, and prohibitions shall be expressed as maximum daily, weekly average (for POTWs only) and monthly average, unless impracticable.

(n) Non-continuous discharges shall be limited in terms of frequency, total mass, maximum rate of discharge, and mass or concentrations of specified pollutants, as appropriate.

(q) When permit effluent limitations or standards imposed at the point of discharge are impractical or infeasible, effluent limitations or standards for discharges of pollutants may be imposed on internal waste streams before mixing with other waste streams or cooling water streams. In those instances, the monitoring required shall also be applied to the internal waste streams. Limits on internal waste streams will be imposed only when the rationale sets forth the exceptional circumstances which make such limitations necessary, such as when the final discharge point is inaccessible (for example, under water), the wastes at the point of discharge are so diluted as to make monitoring impracticable, or the interferences among pollutants at the point of discharge would make detection or analysis impracticable.

(r) Instantaneous maximum concentration or similar limitations may be imposed in permits when: 1. Toxic or harmful parameters are present in such significant amounts or concentrations as to represent a threat to the possibility of maintaining receiving waters in accordance with established classifications; and 2 The discharge is characterized as irregular, such as high peak, short duration flow.

(s) Any discharge or activity authorized by a permit which is not a minor discharge or activity, or the regional administrator requests, in writing, be monitored, or contains a toxic pollutant for which an effluent standard has been established shall be monitored by the

permittee for the following: 1. Flow (in million gallons per day); and 2. Any of the following pollutants: (i) Pollutants (either directly or indirectly through the use of accepted correlation coefficients or equivalent measurements determined to be applicable to the discharge to which they are applied) which are subject to reduction or elimination under the terms and conditions of the permit; (ii) Pollutants which the commissioner finds, on the basis of information available, could have a significant impact on the quality of waters; (iii) Pollutants specified by the administrator, in regulations issued pursuant to the Federal Water Pollution Control Act, as subject to monitoring; and (iv) Any pollutants, in addition to those identified in subparts (i) through (iii) of this part, which the regional administrator or the Commissioner request be monitored

b) **TDEC Rule 0400-40-05-.10 WATER QUALITY-BASED PERMITTING** (1) Effluent limitations on toxic substances will be required in accordance with the General Water Quality Criteria, Chapter 0400-40-03, using the LC50 and/or IC25 criteria and appropriate application factor for each toxic parameter

c) **TDEC Rulee 0400-40-10-.03(3) Text of Cited Federal Regulations 40 CFR § 122.45 Calculating NPDES permit conditions (applicable to State NPDES programs, see § 123.25)**

(a) Outfalls and discharge points. All permit effluent limitations, standards and prohibitions shall be established for each outfall or discharge point of the permitted facility, except as otherwise provided under § 122.44(k) (BMPs where limitations are infeasible) and paragraph (i) of this section (limitations on internal waste streams).

(d) Continuous discharges. For continuous discharges all permit effluent limitations, standards, and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as:
(1) Maximum daily and average monthly discharge limitations for all dischargers other than publicly owned treatment works;

(e) Non-continuous discharges. Discharges which are not continuous, as defined in § 122.2, shall be particularly described and limited, considering the following factors, as appropriate:

(1)Frequency (for example, a batch discharge shall not occur more than once every 3 weeks);

(2) Total mass (for example, not to exceed 100 kilograms of zinc and 200 kilograms of chromium per batch discharge);

(3) Maximum rate of discharge of pollutants during the discharge (for example, not to exceed 2 kilograms of zinc per minute); and

(4) Prohibition or limitation of specified pollutants by mass, concentration, or other appropriate measure (for example, shall not contain at any time more than 0.1 mg/L zinc or more than 250 grams (¼ kilogram) of zinc in any discharge).

(f) **Mass limitations**.

(1) All pollutants limited in permits shall have limitations, standards or prohibitions expressed in terms of mass except:

(i) For pH, temperature, radiation, or other pollutants which cannot appropriately be expressed by mass;

(ii) When applicable standards and limitations are expressed in terms of other units of measurement; or

(iii) If in establishing permit limitations on a case-by-case basis under § 125.3, limitations expressed in terms of mass are infeasible because the mass of the pollutant discharged cannot be related to a measure of operation (for example, discharges of TSS from certain mining operations), and permit conditions ensure that dilution will not be used as a substitute for treatment.

(2) Pollutants limited in terms of mass additionally may be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations.

(h) Internal waste streams

(1) When permit effluent limitations or standards imposed at the point of discharge are impractical or infeasible, effluent limitations or standards for discharges of pollutants may be imposed on internal waste streams before mixing with other waste streams or cooling water streams. In those instances, the monitoring required by § 122.44(i) shall also be applied to the internal waste streams.

(2) Limits on internal waste streams will be imposed only when the fact sheet under § 124.56 sets forth the exceptional circumstances which make such limitations necessary, such as when the final discharge point is inaccessible (for example, under 10 meters of water), the wastes at the point of discharge are so diluted as to make monitoring impracticable, or the interferences among pollutants at the point of discharge would make detection or analysis impracticable.

d) **TDEC Rule 0400-40-03-.03(4)(j)** Recreation use water quality standards are based on 10^{-5} excess lifetime cancer risk for individual contaminants (or groups of contaminants, e.g., Total PCBs)

e) **TDEC Rule 0400-40-03-.05(4)** specifies discharge requirements in permits for discharge to surface water designated as recreational use are based on 30-day minimum five-year recurrence interval stream flow. (This may be estimated by USGS StreamStats.)

f) **TDEC Rule 0400-40-03-.05(6)** All discharges of sewage, industrial waste, and other waste shall receive the degree of treatment or effluent reduction necessary to comply with water quality standards.

g) **TDEC Rule 400-40-03-.03(4)(l)** Fish Consumption Advisories - A public fishing advisory will be considered when the calculated risk of additional cancers exceeds 10-4 for typical consumers or 10-5 for atypical consumers

h) **TDEC Rule 0400-40-03-.05(2)** … Mixing zones shall not apply to the discharge of bioaccumulative pollutants to waters of the state where the risk-based factors in Rule 0400-40-03-.03(4)(l) are exceeded for the pollutant group.

i) **Rule 0400-40-03-.03 (3) The criteria for the use of Fish and Aquatic Life**

(d) Turbidity, Total Suspended Solids, or Color - There shall be no turbidity, total suspended solids, or color in such amounts or of such character that will materially affect fish and aquatic life. In wadeable streams, suspended solid levels over time should not be substantially different than conditions found in reference streams.

(g) Toxic Substances - The waters shall not contain substances or a combination of substances including disease - causing agents which, by way of either direct exposure or indirect exposure through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), physical deformations, or restrict or impair growth in fish or aquatic life or their offspring.

(m) Biological Integrity - The waters shall not be modified through the addition of pollutants or through physical alteration to the extent that the diversity and/or productivity of aquatic biota within the receiving waters are substantially decreased or, in the case of wadeable streams, substantially different from conditions in reference streams in the same ecoregion. The parameters associated with this criterion are the aquatic biota measured. These are response variables.

j) **Rule 0400-40-05-.10 WATER QUALITY-BASED PERMITTING.**

(1) Effluent limitations on toxic substances will be required in accordance with the General Water Quality Criteria, Chapter 0400-40-03, using the LC50 and/or IC25 criteria and appropriate application factor for each toxic parameter.

(2) Appropriate limitations on organic related and other oxygen demanding parameters will be required in any permit to insure adequate dissolved oxygen in the state's waters in accordance with the General Water Quality Criteria, Chapter 0400-40-03.

(3) When a treatment process greater than BAT or conventional unit treatment processes is required by application of these rules, a set of effluent limitations will be required in any permit which will completely describe expected results of such treatment process.

(4) Effluent limitations may be required in any permits to insure compliance with the Antidegradation Statement, Rule 0400-40-03-.06.

These comments are respectfully submitted by:

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Comments regarding Tennessee water quality standards included contributions from Greg Denton, retired manager of the Planning and Standards Section of the Division of Water Pollution Control and Paul Davis former director of the Division of Water Pollution Control.

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[i] *Focused Feasibility Study for Water Management for the Disposal of CERCLA Waste on the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE/OR/01-2664&D2) APPENDIX E. Mercury Concentration in Environmental Management Disposal Facility Leachate includes:
"Untreated soils and debris that pass TCLP will be disposed of in the landfill. Although mercury has naturally high Kds, the amount of mercury-contaminated waste soil and debris expected to be disposed is large enough to result in significant "as-disposed" soil mercury concentrations that may result in measurable mercury concentrations in the leachate (see Fig. E.3). "As-generated" soil/debris mercury concentrations must be adjusted to account for the addition of soil fill, necessary for landfill stability, and the inclusion of other wastes in the landfill resulting in an "as-disposed" mercury concentration. The assumed volume of mercury-contaminated debris and soil to be disposed that will not require treatment to meet LDRs is approximately 300,000 CY. This material will be disposed along with the mercurycontaining debris and soil within the first three cells resulting in a final as-disposed volume of approximately 1.25M CY. Consequently, the as-generated mercury concentrations would be reduced by a factor of about four. Assuming the resulting, as-disposed concentration is in the range of 0.03 to 0.25 mg/kg (equivalent to an as-generated waste mercury concentrations corresponding to 0.1 to ~1 mg/kg), leachate concentrations could exceed the 51 ppt ambient water quality criteria (AWQC) for mercury depending on the Kd exhibited (see Fig. E.3). As noted in the Alpha-5 characterization results, mercury concentrations are highly variable, and 95% of debris samples exhibiting mercury concentrations up to 151 mg/kg may pass TCLP. Taking this as an upper bound of the as-generated mercury concentration and assuming the Kds for contaminated debris would be the same as soil, a leachate mercury concentration in the range of 10,000 (highest Kd) to 90,000 ppt (lowest Kd) might be possible. With the uncertainty in volumes of soil/debris to be disposed, and the variability in as-generated mercury concentrations, predictions are highly uncertain. It is expected that leachate concentrations will vary widely for reasons such as variability in rainfall, sequencing of waste volumes, operations procedures, etc."

[ii] *Focused Feasibility Study for Water Management for the Disposal of CERCLA Waste on the Oak Ridge Reservation, Oak Ridge, Tennessee (*DOE/OR/01-2664&D1) (DOE/OR/01-2664&D2) and (DOE/OR/01-2664&D3)

[iii] The 95% Upper Confidence Level of the sum of PCB-1254 and PCB-1260 in fish collected from Bear Creek for the 5-year interval of Calendar Year (CY) 2017 through CY2021 is 0.782 mg/kg. Using the EPA Regional Screening Level Calculator at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search with 17500 mg/day fish ingestion rate, 365 days per year, for 26 years consistent with assumptions in EMDF PRG Development, an existing excess lifetime cancer risk (ELCR) of 1.27E-04 from ingestion of fish collected from Bear Creek is calculated.

[iv] TDEC Rule 0400-40-03-.06(2)(a)

In waters with unavailable parameters, new or increased discharges that would cause measurable degradation of the parameter that is unavailable shall not be authorized. Nor will discharges be authorized in such waters if they cause additional loadings of unavailable parameters that are bioaccumulative or that have criteria below current method detection levels.

[v] OREIS data of mercury in surface water at Bear Creek sampling stations BCK 9.2 and BCK 07.87 with mercury analysis performed by EPA method 1631 or 1631E from 2009 through 2020 were evaluated using ProUCL 5.1. This evaluation yielded a mercury concentration 95% UCL of 5.17 ng/L (ppt) and a median mercury concentration of 3.3 ng/L (ppt).

[vi] *Focused Feasibility Study for Water Management for the Disposal of CERCLA Waste on the Oak Ridge Reservation, Oak Ridge, Tennessee (*DOE/OR/01-2664&D1) (DOE/OR/01-2664&D2) and (DOE/OR/01-2664&D3)

[vii] Derived from USGS StreamStats